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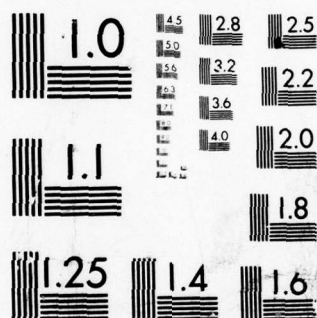
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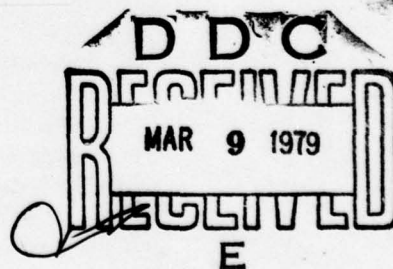
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LEVEL II

The nomenclature, "Night Observation Device - Long Range" now applies to the AN/TAS-6. This later device is entirely different from the obsolete AN/TSS-7.



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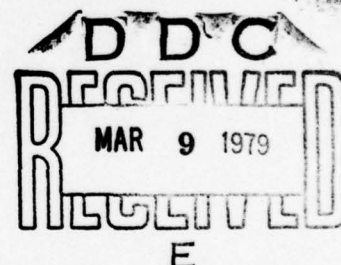
Consulting Report

A COMPARISON OF INSTRUCTIONAL APPROACHES FOR TRAINING  
OPERATORS OF THE NIGHT OBSERVATION DEVICE-LONG RANGE,  
AN/TSS-7

by

John D. Engel

September 1970



Work Unit NIGHTSIGHTS: Work Sub-Unit IV, "Training Program  
Development for Specific Devices in SEA NITEOPS"

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The purpose of the work summarized in this report was to compare the effectiveness of a number of instructional approaches for training NOD-LR operators. The information may be useful to people who are responsible for the training of (a) NOD-LR operators in particular, and (b) operators of night vision devices in general.		

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## PREFACE

The purpose of Work Unit NIGHTSIGHTS is to identify critical human factors problems in the use of new night operations devices and to develop effective techniques for training men to use the devices. This report is a product of NIGHTSIGHTS IV, "Training Program Development for Specific Devices in SEA NITEOPS." NIGHTSIGHTS IV was planned as a three-phase program for each of the selected devices. In the first phase, lesson plans were drafted on the basis of information obtained from the available literature and from attendance during factory teaming on the particular device. During the second phase, a device was made available to HumRRO for use in evaluating proposed training concepts. In the third phase, a prototype pictorial program was developed as a training and/or performance aid for the operator of the device. This report deals with the second phase, namely, the evaluation of a number of instructional approaches for training operators of the Night Observation Device-Long Range, AN/TSS-7.

The purpose of the work summarized in this report was to compare the effectiveness of a number of instructional approaches for training NOD-LR operators. The information may be useful to people who are responsible for the training of (a) NOD-LR operators in particular, and (b) operators of night vision devices in general.

Work Unit NIGHTSIGHTS is being conducted at HumRRO Division No. 2, Fort Knox, Kentucky. The Division Director is Dr. Donald F. Haggard, the Work Unit Leader is Dr. Harold Bishop, and the military research assistant is SP5 Richard Frank. The Military Chief of the Armor HRU is LTC Joseph A. DeAngelis.

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A COMPARISON OF INSTRUCTIONAL APPROACHES FOR TRAINING OPERATORS  
OF THE NIGHT OBSERVATION DEVICE-LONG RANGE, AN/TSS-7

## PROBLEM

With the introduction of night vision devices, the Army has been given greatly increased operational scope, but the new devices have presented a number of operator problems. To resolve these problems and to facilitate the most efficient use of the devices, relevant research and the development of operator training programs are required. The purpose of this report is to describe the development and evaluation of a number of instructional approaches in a prototype training program for operators of the Night Observation Device-Long Range, AN/TSS-7 (NOD-LR).

## METHOD

### Subjects

The G3 Personnel Section at Fort Knox, Kentucky assigned 37 enlisted men from the available manpower. Their ages ranged from 20 to 24 years; mean age was 21.4 years. HumRRO personnel assigned subjects, in chronological order of arrival at the US Army Human Research Unit (HRU), to four experimental groups. The instructional method used for a group was determined by a random drawing of numbers corresponding to the instructional methods.

Group 1 contained 10 subjects whose General Technical (GT) scores ranged from 98 to 128; the mean score was 107.6. Group 2 contained 9 subjects whose GT scores ranged from 98 to 120; the mean was 109.2. Group 3 contained 8 subjects whose GT scores ranged from 89 to 120; the mean was 103.0. Group 4 contained 10 subjects whose GT scores ranged from 92 to 109; the mean was 102.5.

As part of laser safety procedures, a thorough ophthalmological examination was given to each subject before and after the program.

### Research Team

Two members of the HumRRO research staff were responsible for the overall conduct of the study. An experienced SEA NITEOPS team representative conducted the training course and assisted in the end-of-course performance testing. An E7 NCOIC and a safety officer were responsible for providing information on laser safety and enforcing laser safety regulations in the field. Two SP5 psychological research assistants aided in various phases of the program.

### Research Approach

The training was conducted in two phases; classroom training and practical exercise training in the laboratory. The four experimental groups received instruction on the same material, since the instructional objectives were the same for all groups. The groups differed on two variables, type of instruction and type of training aid.

The experimental design is illustrated below.

<u>Type of Training Aid</u>	<u>Type of Instruction</u>	
	<u>Platform Instruction</u>	<u>Videotape Instruction</u>
<u>Picture Guide</u>	Group 2	Group 4
<u>No Picture Guide</u>	Group 1	Group 3

The two methods of instruction, platform instruction and videotape instruction, were selected for two reasons: (a) Platform centered instruction is the most frequently used method of presenting Army training materials; and (b) videotape instruction has received increased use and emphasis as a method of presenting Army training materials.

Platform Instruction. In the development of the platform instruction, an attempt was made to overcome certain common limitations:<sup>1</sup>

1. A limited use of "hands-on" instruction.
2. Neglect of certain principles of instruction, such as: (a) providing course objectives, (b) allowing the student to respond, and (c) providing for reinforcement.

To overcome the first limitation, a number of procedures were employed during instruction. First, a set of training objectives was given to each student to make him aware of what he should be able to do at the end of the course. Second, a series of class tests was incorporated into the instruction, to provide the student with an opportunity to respond to the material and to perform the required action. Third, immediately after each class test the instructor reviewed the questions and answers. This procedure provided the student with knowledge of results (KOR). During this time the instructor also re-emphasized the relevant critical teaching points.

Videotape Instruction. A videotape was produced by recording the instructor's live presentation of platform instruction. One essential difference between the videotape and platform instruction was that practical exercise was interspersed during the course of the filmed demonstration of assembly, disassembly and operational procedures, as suggested by Margolius and Sheffield;<sup>2</sup> whereas in the platform instruction practice occurred after each demonstration.

<sup>1</sup>M. F. Brennan et al., Training Management in Basic Combat Training, Consulting Report (Presidio of Monterey, Cal., HumRRO Division No. 3, October 1969).

<sup>2</sup>G. Margolius and F. Sheffield, "Optimum Methods of Combining Practice with Filmed Demonstration in Teaching Complex Response Sequences," Chapter 32 in R. Anderson, Ed., Current Research on Instruction (Englewood Cliffs, N. J., Prentice-Hall, 1969), pp. 281-286.



### Development of Prototype Training Materials

The first step was to determine the operator procedures or tasks. HumRRO personnel obtained the operator tasks from available publications and from attendance at the factory training course on the device. Verification of the procedures was accomplished with the device and under the guidance of an experienced SEA NITEOPS team representative.

From this information, a set of instructional objectives was written and a picture guide was developed.<sup>3</sup> An instructional objective is a statement of what the learner should be able to do when he completes a training program. The objectives were reviewed by a SEA NITEOPS representative to insure the relevancy of the various conditions and standards associated with the objectives. The instructional objectives (listed in Appendix A) were used as a basis for developing a course outline, class quizzes, and end-of-course proficiency tests. (Copies of these materials may be found in Appendices B, C, and D respectively.)

Although the experimental program was severely compromised by the scheduling of the device and its limited availability, the staff attempted to sequence the course content by applying the functional context principle.<sup>4</sup> This approach is characterized by two primary requirements: First, the context must have meaning for the trainee in terms of both the overall objectives of the course and his conception of the course. Second, the content must be organized so that the relation of new material to that previously learned is readily apparent. The new material should be placed in a background of old or familiar material so that the student can relate the new to the old.

The instruction was developed on the basis of what a NOD-LR operator must know and do to perform his tasks properly. Relating the instructional sequence to the operator's tasks meant teaching essential knowledge and skills in conjunction with these tasks. The material which was presented might be characterized as necessary to know rather than nice to know.

The master schedule for the Experimental Program of Instruction (EPOI) for the NOD-LR operator classroom training is presented in Table 1 and the major blocks of instruction for the practical exercises are presented in Table 2.

As noted, the videotape was produced during live platform instruction. Six enlisted men, similar to the sample forming the experimental groups, were given a list of questions which were frequently asked during the course of instruction. The six men were instructed to ask these

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<sup>3</sup>R. Frank and J. Engel, A Prototype Pictorial Guide for the Night Observation Device-Long Range, AN/TSS-7 Operator, Research By-Product (Fort Knox, Ky., HumRRO Division No. 2, February 1970).

<sup>4</sup>R. G. Smith, Jr., The Design of Instructional Systems, TR 66-18 (Alexandria, Va., HumRRO, November 1966).

Table 1

Experimental Program of Instruction for the Classroom Training  
of the NOD-LR Operator

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GENERAL ORIENTATION:	Purpose of NOD-LR and Its Army Role. System Concept. General Description of NOD-LR.
INSTRUCTIONAL OBJECTIVES COVERED:	<u>A</u> . (See Appendix A for explanation.)
MINUTES OF INSTRUCTION:	60.
SCOPE:	The course began with an explanation of the entire NOD-LR system and its role in night operations. The purpose of the orientation was to answer questions about the purpose and importance of the student's participation in the course. (If this were an operational training situation, this unit would answer questions about the purpose and importance of the student's future job.)

---

ASSEMBLY OF NOD-LR:	Mount and Tripod Subassemblies. Viewer Subassembly. Illuminator Subassembly.
INSTRUCTIONAL OBJECTIVES COVERED:	<u>A</u> , <u>B</u> , <u>C</u> .
MINUTES OF INSTRUCTION:	120.
SCOPE:	This block of instruction was concerned with a description of the various NOD-LR subsystems and administration of the procedures required to assemble the system and operate the various read-out panels and scales. The instruction was conducted with the device and with visuals of the equipment. The instruction also provided the student with the necessary terminology for discussing and asking questions about the equipment during later blocks of instruction.

---

THEORY AND PRACTICE OF NOD-LR OPERATIONS:	Preoperational Inspections. Preoperational Checks. Modes of Operation. Field Operations.
INSTRUCTIONAL OBJECTIVES COVERED:	<u>D</u> , <u>E</u> , <u>F</u> , <u>G</u> .
MINUTES OF INSTRUCTION:	90.
SCOPE:	This block of instruction was concerned with describing the NOD-LR preoperational settings and inspections as well as the various modes of operation. Various operational situations were described and the modes of operation appropriate for each. The instruction was conducted with the device and with visuals of the equipment. The instructor provided the students with the necessary terminology.

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POWER SOURCES AND SYSTEM MAINTENANCE:	Primary Power. Secondary Power. Operator Maintenance.
INSTRUCTIONAL OBJECTIVES COVERED:	<u>H</u> .
MINUTES OF INSTRUCTION:	45.
SCOPE:	This block of instruction described the NOD-LR's primary and secondary power sources. In addition, operator maintenance tasks were described. The instruction was conducted on the equipment and the necessary terminology was presented.

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Table 1 Continued

DISASSEMBLY OF NOD-LR: Illuminator Subassembly.  
Viewer Subassembly.  
Mount and Tripod Subassemblies.

INSTRUCTIONAL OBJECTIVES COVERED: I.

MINUTES OF INSTRUCTION: 30.

SCOPE: This block of instruction was concerned with demonstrating the disassembly of the NOD-LR subsystems and proper manner of packing in the back packs. The demonstration was conducted with the equipment.

---

FAMILIARIZATION ON TARGET IDENTIFICATION AND RECOGNITION

INSTRUCTIONAL OBJECTIVES COVERED: J, K, L.

MINUTES OF INSTRUCTION: 150.

SCOPE: This block of instruction was concerned with familiarizing the student with appearance of targets viewed through the NOD-LR. It was decided that because of the time and equipment restraints, only a familiarization on this topic was feasible. The presentation consisted of 35mm slides of targets, photographed through the NOD-LR.

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LASER SAFETY

INSTRUCTIONAL OBJECTIVES COVERED: M.

MINUTES OF INSTRUCTION: 10.

SCOPE: This final block of instruction was concerned with describing the various laser safety precautions for the NOD-LR.

---

Table 2

Experimental Program of Instruction for the Practical Exercise Training  
of the NOD-LR Operator

---

ASSEMBLY/DISASSEMBLY OF THE NOD-LR

INSTRUCTIONAL OBJECTIVES COVERED: C, I.

MINUTES OF INSTRUCTION: 300.

SCOPE: During this period the student practiced assembly and disassembly of the NOD-LR.

---

PREOPERATIONAL SETTINGS, CHECKS AND MODES OF OPERATION

INSTRUCTIONAL OBJECTIVES COVERED: D.

MINUTES OF INSTRUCTION: 120.

SCOPE: Here, the student was allowed to perform the preoperational settings and to place the NOD-LR in its various modes of operation. This practice was accomplished on a procedural simulator (See Figure 1).

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RANGING AND TARGET DESIGNATION

INSTRUCTIONAL OBJECTIVES COVERED: L.

MINUTES OF INSTRUCTION: 30.

SCOPE: Here, the student practices setting the procedural simulator into the active mode for ranging and for target designation.

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questions, and any others they might have, at appropriate times during instruction. This procedure was used to humanize the videotape and to standardize the additional types of information generated as part of live instruction.

To provide each student with individual practice in setting the NOD-LR control panels for the various modes of operation, twelve rectangular boxes were constructed. They were designed to simulate the continuous and discrete NOD-LR control panels and were approximately of panel size. Such critical factors as control shape, movement and relative position were exactly the same as those on the device. (Refer to Figure 1.)

To provide the students familiarization training in target identification, a series of 35mm black and white slide photographs of various vehicle and personnel targets were taken through the NOD-LR. The targets were photographed at a near range and a far range, and with the NOD-LR in both Active and Passive modes of operation. A front and side view of each target was photographed. Two sets of training slides were assembled from these photographs. Table 3 is a list of the slides taken of each target.

Because of equipment failure and unfavorable conditions, it was not possible to obtain photos of (a) APC and personnel targets at the far range while the NOD-LR was in the Active mode of operation, or (b) personnel targets at the far range while the NOD-LR was in the Passive mode of operation.

Table 3

The Two Sets of Training Photos, for Each Type of Target

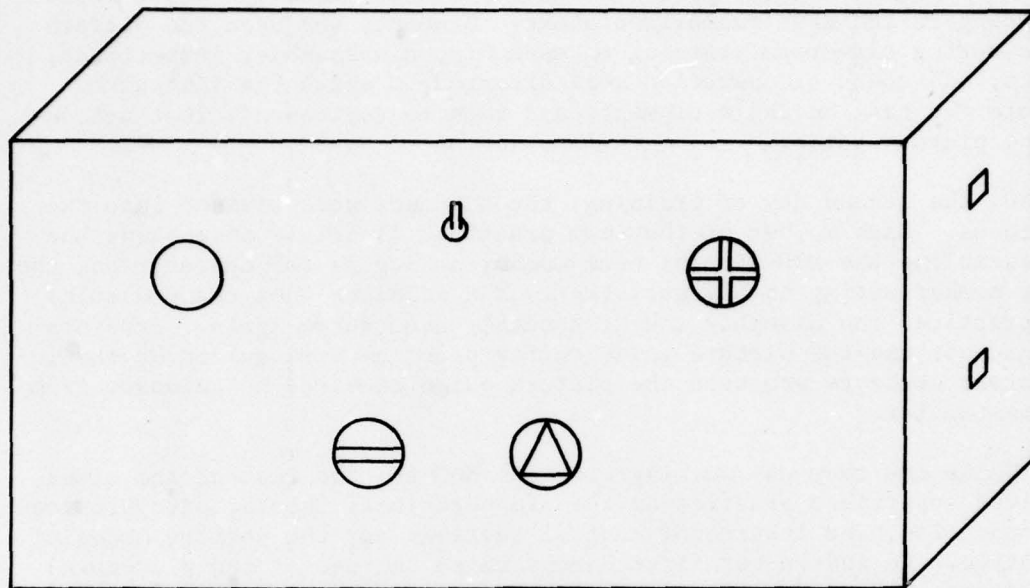
Target Type	Set 1, Active Mode Photos				Set 2, Passive Mode Photos			
	Near		Far		Near		Far	
1/4-Ton Truck	Front	Side	Front	Side	Front	Side	Front	Side
5/4-Ton Truck	Front	Side	Front	Side	Front	Side	Front	Side
APC	Front	Side			Front	Side	Front	Side
Personnel	Front				Front			

#### Presentation of Instruction

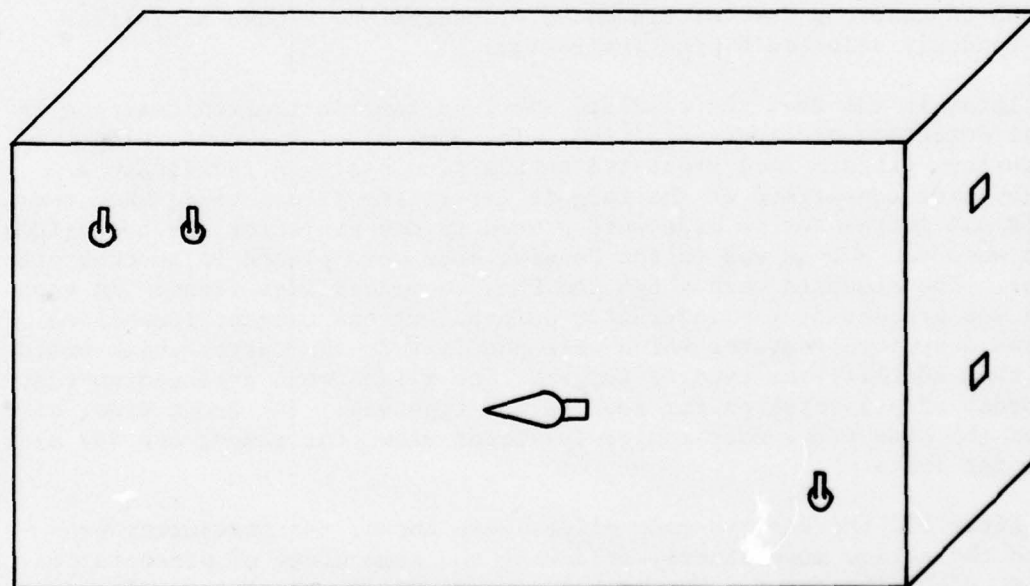
During the training program, the training content, time, and instructor were held constant for all groups.

On the first day of training the students received a thorough briefing on the purpose of the project and were encouraged to do their best. It was emphasized that they were not being personally evaluated either during or after the course of instruction. They were encouraged to view

CONTINUOUS AND DISCRETE CONTROL PANELS  
OF THE NOD-LR PROCEDURAL SIMULATOR



CONTINUOUS PANEL



DISCRETE PANEL

Figure 1



their participation in the course as a way of helping to determine the most effective method of training men in Vietnam to use this new device. After the briefing, the formal classroom instruction was begun. The students received either platform instruction or videotape instruction according to the EPOI summarized above. Students who used the picture guide during classroom training on assembly, disassembly, inspections, checks, and modes of operation were directed to watch the instructor perform the task on the equipment, and then to review only that action in the picture guide.

On the second day of training, the students were divided into two-man teams. Each member of the team practiced (1 trial) assembling and disassembling the NOD-LR, one team member acting as the operator and the other member acting as his assistant. The students then changed roles and practiced the assembly and disassembly procedures again. Students who did not use the picture guide during practice were guided by the instructor; students who used the picture guide received no guidance from the instructor.

While one team was working with the NOD-LR, the rest of the class received supervised practice on the preoperational checks, preoperational inspection, and instrument control settings for the various modes of operation. An instructor first demonstrated the use of the procedural simulators, then the students practiced each activity ten times. During this practice, students who used the picture guide were instructed to watch the instructor perform the task, and then to review only that task in the picture guide. Students who did not use the picture guide were guided by the instructor. After the practice session, the instructor asked the students to perform certain checks and inspections, and to set the NOD-LR controls for certain modes of operation. These activities were randomly selected by the instructor.

Later in the day, the students received familiarization training in target detection and identification. The 35mm black and white slides of the various targets were presented to the students. To facilitate a side-by-side comparison of the targets later, the slides taken when the NOD-LR was in the Active mode were placed in one projector and the slides taken when the NOD-LR was in the Passive mode were placed in another projector. The students were shown the Passive mode slides first. As each slide was projected, the instructor pointed out the target, identified it, and described features which were peculiar to the target which would help them identify the type of target. The slides were arranged so that the order of presentation for each target type was: (a) front view, near range; (b) side view, near range; (c) front view, far range; and (d) side view, far range.

After all the Passive mode slides were shown, the instructor presented the Active mode slides, following the same order of presentation as that specified above. The next procedure was to present a pair of comparable (same view, same range) slides of a target, one taken in the Passive mode, the other in the Active, by projecting the two slides, one

above the other, on the same screen. This technique enabled students to compare the appearances of any target as viewed in the Passive and in the Active modes.

After target familiarization was completed, the instructor administered a class quiz composed of a random presentation of target slides similar to those used for training. Each slide was projected for twenty seconds onto a grid pattern. A corresponding grid pattern was given on the answer sheet and the student was asked to place an x in that part of the grid where the target was located. They were also asked to identify the following: (a) target type; (b) target view; (c) mode of operation; and (d) relative range (near or far). After the quiz, the instructor reviewed each slide and explained the answer.

### Training Quality Control Measures

Development. To determine whether the experimental (prototype) training program met the training objectives, and to compare the relative effectiveness of the various training approaches, two types of proficiency tests were developed, paper and pencil job knowledge tests and work sample performance tests. Both types were based on the training objectives described above.

Administration and Scoring. The day after the completion of the training, each group received (a) a written test, (b) a performance test, and (c) the first half of the field test; the second half was administered the following day. The various tests were administered by staff members who were trained in test administration procedures. (A copy of each test is presented in Appendix D.)

1. Written Test. This was a 21-item paper and pencil test which required the students to indicate (a) names and locations of all NOD-LR parts, (b) knowledge of NOD-LR operations, maintenance and safety, and (c) measurement characteristics and use of all scales and indicators. The subjects were allowed a maximum time of one hour, and were scored on the basis of one point for each correct answer.

2. Work Sample Test. This was a 10-item test developed to measure the students' proficiency in performing assembly and disassembly procedures, preoperational checks and settings, and the setting for the various modes of operation. A maximum time limit was set for each question.

The subjects were scored on the basis of one point for each correct step or procedure. In addition, a performance checklist for the assembly and disassembly items in the work sample test was developed. It was headed by a block of three passing and four failing categories. If a subject correctly performed the assembly task, he was scored in the pass section, and his degree of pass was indicated by one of the descriptive statements. If he correctly performed the disassembly task he was scored in the same manner. The same scoring procedure was used if he failed



the problem. The descriptive statements used in scoring are:

PASS: Used good procedures; knew what he was doing.  
Had a pretty good idea, but some guesswork.  
Knew very little; probably just a good guess.

FAIL: Had a fairly good grasp of the problem but failed.  
Some knowledge of what to do but much guesswork also.  
Started but gave up very quickly.  
Didn't know enough to get started.

This performance checklist was used only with the assembly and disassembly items, since this type of scoring was felt to be most applicable to long sequential tasks and not to short discrete tasks such as preoperational settings and modes of operation.

3. Field Test. This was an 8-item test developed to measure the students' proficiency in detecting, identifying, and ranging a target, and in reading its azimuth and elevation. The types of targets were 1/4-ton trucks, APC's, tanks, and groups of three infantrymen. The test was divided into two parts. The students were tested with stationary targets the first evening and with moving targets the second evening. The targets were placed in the configuration shown in Figures 2 and 3.

Before the field test, the target positions were marked with tape to insure that the vehicles would have the same positions for all groups. The moving targets moved along a 100-foot line marked with engineer tape. The line of movement was across the field of view of the NOD-LR. Before beginning the test, the experimenters assembled the NOD-LR at a marked site and developed a range card for the targets.

The subjects were sheltered in a general purpose (GP) tent approximately 100 meters from the NOD-LR site. Each subject was dark adapted by having him wear a pair of red dark adaptation goggles for approximately 20 minutes before operating the device. The subject was brought from the tent to the NOD-LR by one of the staff members. The instructor then told the subject that there were a number of targets he was to find and report. As a precautionary safety measure, the instructor spent 10 minutes reviewing the procedures for ranging, then instructed the subject to range on a distant tree. The instructor then began the field test by asking the first question: "Given the conditions this evening, in what mode will you view?" If the student gave the wrong answer, the instructor told him the correct mode and then read the following instructions: "You are to scan--I mean move the NOD-LR from right to left--in an area between the tree line and the hill (instructor pointed these out). When you detect a target let me know. Do you have any questions? You have 20 minutes. Begin." (The next subject was instructed to move from left to right in order to counterbalance such variables as practice effect.)

When a subject detected a target, the instructor asked for azimuth, elevation, range, and identification, then asked the subject to continue

## LOCATIONS OF TEST TARGETS

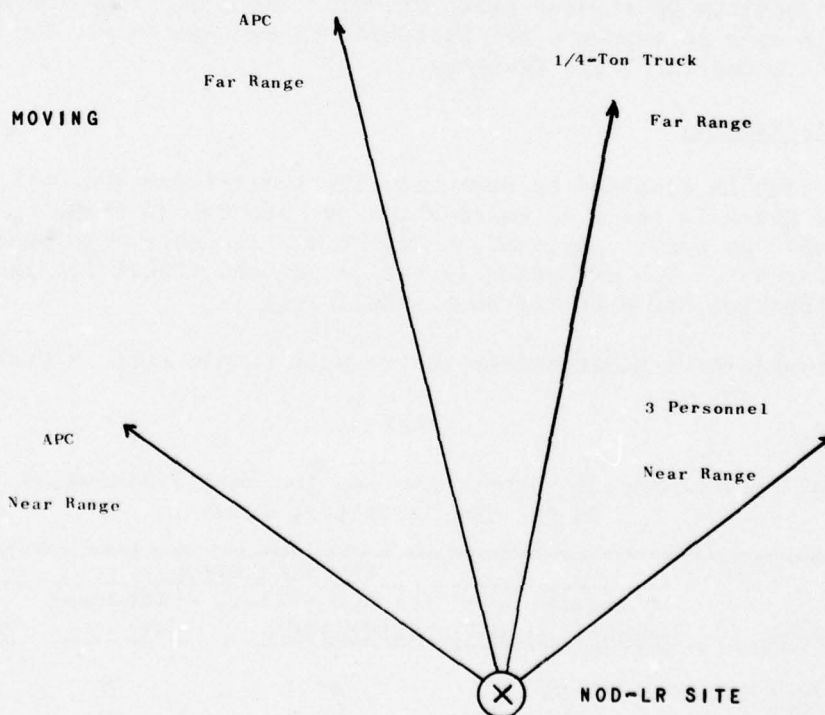
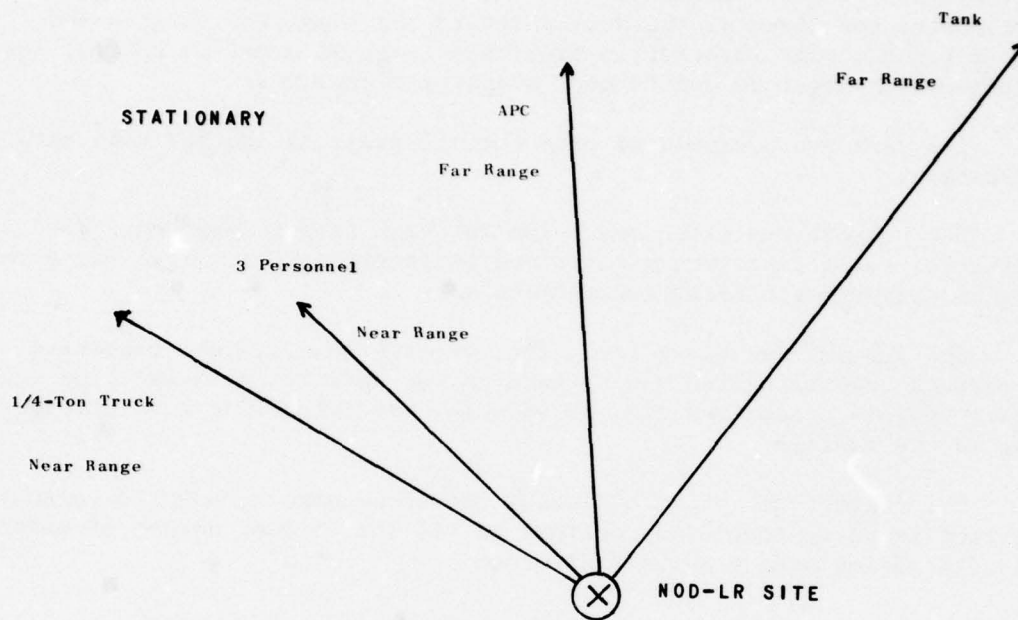


Figure 2

searching. If after 20 minutes he had not detected all the targets, the instructor directed the NOD-LR toward the remaining targets and asked for the same information about each one, in order to control for errors which might be due to poor scanning techniques.

The same procedures were used for all subjects and for both sets of targets.

The subject was given one point for each target detected. The criterion for a detection was defined as acquiring the target and giving its azimuth and elevation correctly.

The subject was given one point for each correct identification. A correct identification was defined as (a) specifying target type (e.g., wheel vehicle, track vehicle, personnel), and (b) having correctly detected the vehicle.

The subject was given one point for each correct range to target. Correct range to target was defined as (a) the correct number of meters, and (b) having made a correct detection.

## RESULTS AND DISCUSSION

The training program provided information on the end-of-course level and quality of student performances. The results of the analysis of each group's performance are presented in two sections: (a) Laboratory Testing and (b) Field Testing.

### Laboratory Testing

The results obtained by administering the written and work sample tests are given in Table 4, which shows the percent of items passed by each group. As shown, performance levels on the tests were generally over 80 percent. The exception is the 71 percent result for the Platform Instruction Group on the work sample test.

A breakdown of performances on the work sample test is presented

Table 4

Mean Percentages of Items Passed by the Four Training Groups  
on the Two Laboratory Tests

Type of Test	Training Group			
	Platform In- struction (PI)	PI and Picture Guide (PG)	Videotape (VT)	VT and PG
Written Test	85	87	80	85
Work Sample Test	71	84	84	81



Table 5

Mean Percentages of Items Passed by the Four Training Groups  
on the Various Sections of the Work Sample Test

Section of Work Sample Test	Training Group			
	PI	PI and PG	VT	VT and PG
Assembly/Disassembly	95	100	100	100
Preoperational Inspections	32	53	60	70
Preoperational Checks	89	94	97	88
Modes of Operation:				
Standby Mode	90	100	100	80
Standby Passive Mode	50	78	50	50
Passive Prime Mode	90	100	88	80
Passive Battery Mode	60	89	100	100
Active Mode	80	89	100	80
Active Mode/Passive Use	50	89	50	50

in Table 5, which shows the percent of items passed by each group on each section of the work sample. The results shown in the table may be summarized as follows:

1. All groups, except the Platform Instruction Group, which scored 95 percent, received a perfect score on assembly/disassembly procedures.

2. The performance levels for the preoperational inspections were relatively low. It is felt that this result is due to some confusion between preoperational inspections and preoperational checks. Students do not seem to differentiate these tasks, though they are considered discrete by the developer and technical experts. This explanation is apparent from the errors made. Test administrators noted that students generally seemed to interpret the inspections as checks. This would seem reasonable in light of the high percentages recorded for preoperational checks in Table 5. Also, when the students' responses for the preoperational checks and inspections are combined, the mean percent of items passed by each group is as follows: Platform Instruction, 69; Platform Instruction and Picture Guide, 79; Videotape, 84; Videotape and Picture Guide, 81.

3. The students within each group, and the groups collectively, seem to have the most difficulty in making the control settings for the Standby Passive mode and Active mode/Passive use. An investigation of the errors made in setting the device controls for the Passive mode reveals that a large number of students neglected to place the cooler switch in the ON position. The cooler ON position is associated with the Active mode and the cooler OFF position with the Passive mode. When the students were asked to place the NOD-LR in the Standby Passive mode they probably associated this mode with the cooler OFF position and for this reason made the incorrect response.

An investigation of the Active mode/Passive use errors reveals that the students placed the cooler switch in the ON position. It is felt that this error occurred for the reason mentioned above, i.e., the cooler ON position is associated with the Active mode and the cooler OFF position with the Passive mode. When the students were asked to place the NOD-LR in the Active mode/Passive use, they probably associated Active with the cooler ON position and for this reason made the incorrect response.

Performance Comparison. Mean performance scores on the two tests are plotted in Figure 3. An analysis of variance of the written test data is summarized in Table 6.<sup>5</sup>

The results show that the differences in performance levels on the written test are not reliable, i.e., neither type of instruction nor type of training aid significantly affected performance on the written test, probably because the written test was concerned with knowledge items, and either platform instruction or videotape instruction would provide the same information and in the same manner.

The function of the picture guide was primarily to facilitate training in procedural/psychomotor tasks, and it would not be expected that this type of training aid would contribute significantly to performance on a paper and pencil test of knowledge.

An analysis of variance of the work sample data is summarized in Table 7. The results of the analysis show that in itself, neither type of instruction nor type of training aid reliably affected performance on the work sample. But there is a statistically significant interaction, clearly shown in Figure 4 and Table 8. Both figure and table show a symmetrical interaction, i.e., the effect of the interaction of the variables is opposite at the two levels of B (type of training aid). Practically, in the present case, this means that the videotape

Table 6

Summary Analysis of Variance of the Performance Levels of Subjects  
on the Written Test for Different Types of Training

Source of Variance	df	Mean Square	F	p
Type of Instruction	1	41.45	1.04	NS
Type of Training Aid	1	37.81	.95	NS
Instruction x Training Aid	1	5.54	.14	NS
Error Within Cells	<u>33</u>	39.98		
	36			

<sup>5</sup>G. Ferguson, Statistical Analysis in Psychology and Education (McGraw-Hill, New York, 1959), p. 256.



MEAN GROUP PERFORMANCES ON THE WRITTEN AND WORK SAMPLE TESTS  
AS A FUNCTION OF TYPE OF TRAINING

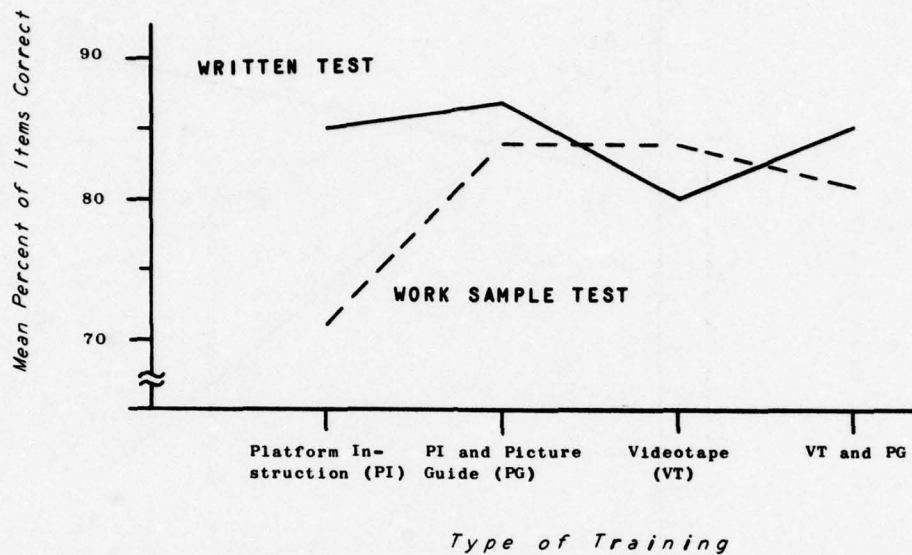


Figure 3

Table 7

Summary Analysis of Variance of the Performance Levels of Subjects  
on the Work Sample Test for Different Types of Training

Source of Variance	df	Mean Square	F	p
Type of Instruction	1	9.09	1.51	NS
Type of Training Aid	1	11.45	1.91	NS
Instruction x Training Aid	1	30.36	5.05	.01
Error Within Cells	33	6.01		
	36			

MEAN SCORES ON THE WORK SAMPLE TEST FOR LEVELS OF B  
(TRAINING AID) AT EACH LEVEL OF A (INSTRUCTION)

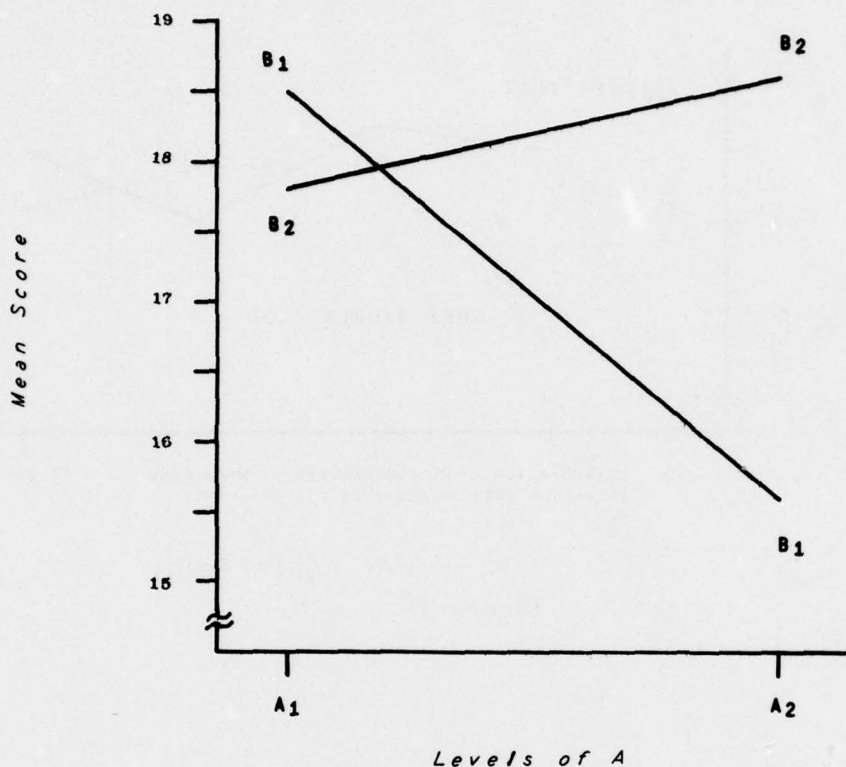


Figure 4

Table 8

Mean Work Sample Scores As a Function of Type of Instruction  
and Type of Training Aid

Type of Instruction	Type of Training Aid	
	No Picture Guide (B1)	Picture Guide (B2)
Videotape Instruction (A1)	18.50	17.80
Platform Instruction (A2)	15.60	18.55

instruction without the picture guide training aid and the platform instruction with the picture guide seem to be most effective.

Essentially, the picture guide provided the student with a simple, close-up, visual representation of the performance of the assembly/disassembly procedures, preoperational inspection and checks, and settings for the various modes of operation. These elements were an integral part of the videotape but not of the platform instruction. This fact would seem to explain the finding that the picture guide was effective with the platform instruction but not with the videotape.

Performance Characteristics. Performance characteristics of the four groups on the assembly and disassembly tasks are shown in Table 9. The data show that the highest percentage of students who used good procedures were members of the two groups which used the picture guide as a training aid.

Table 9

Percentages of Men in the Various Training Groups Whose Scores Fell in the Various Pass-Fail Categories

Pass-Fail Category	PI	PI and PG	VT	VT and PG
Pass: Good Procedures	45	78	38	65
Some Guesswork	25	17	50	35
All Guesswork	25	5	12	0
Fail: Fairly Good Procedures	0	0	0	0
Much Guesswork	5	0	0	0
Gave Up Quickly	0	0	0	0
Didn't Get Started	0	0	0	0

In summary, the results of the statistical analyses, as shown in Tables 4 through 9, indicate that:

1. Performance levels achieved on the written and work sample tests were generally over 80%.
2. Performance levels on the various sections of the work sample were generally over 80%. The two exceptions were preoperational inspections (32% - 70%) and settings for the Standby Passive mode of operation (50% - 78%) and the Active mode/Passive use (50% - 89%).
3. Neither type of instruction nor type of training aid significantly affected performance on the written test.
4. Neither type of instruction nor type of training aid significantly affected performance on the work sample test, but there was a significant interaction which seems to indicate, in this case, that the



videotape instruction without the picture guide and the platform instruction with the picture guide are the most effective training methods in terms of performance of tasks contained in the work sample test.

5. The two groups which used the picture guide training aid had the highest percentage of members who used good procedures.

#### Field Testing

The field test was an 8-item work sample test developed to measure the students' proficiency in detecting, identifying, and ranging a target.

A very serious problem encountered in field testing was the lack of uniformity of testing conditions for the students within a group and between groups. There were two aspects of this lack of uniformity. One was lack of uniformity in the environment. Ambient light level and such weather conditions as rain, snow, fog, and extremes of temperature varied widely within any given test period, and between periods.

The other aspect was lack of uniformity in NOD-LR operation. The operational characteristics of the NOD-LR varied widely during and between test periods. The laser gradually lost power over time and affected ranging and the use of the Active mode. As temperature decreased, there was a tendency for the laser lens to become iced and cause a great decrease in the NOD-LR's ranging and Active mode capabilities.

Because of these poor environmental and operational conditions, the comparability of scores between either individuals or groups was severely limited. No statistical tests of the significance of differences between groups were calculated. It is felt that the substantial environmental and operational variance present in the scores reduces the meaningfulness of such tests.

However, the range and median percentages of targets correctly detected, identified, and ranged are given in Table 10, to indicate the level of proficiency obtained under the poor conditions noted above. The subjects' proficiency level was moderately high, considering that they received minimal familiarization training and that conditions were

Table 10

Ranges and Median Percentages of Stationary and Moving Targets Correctly Detected (D), Identified (I), and Ranged (R) by the Combined Groups

Target (Moving or Stationary)	Range of Percents			Median Percent		
	D	I	R	D	I	R
Stationary	33-100	0-100	0-75	60	60	50
Moving	33-100	0-100	0-100	67	50	50

often unsatisfactory during field testing.

The students' reactions to the familiarization training and field testing are noteworthy. In comments collected after the completion of testing, students said that the familiarization training they received was very valuable and that they could have done better if, as they commented, "the NOD-LR worked better."

#### SUMMARY AND CONCLUSIONS

The investigation summarized here was a comparison of the effectiveness of a number of instructional approaches for training the NOD-LR operator. The primary results of the research are the following:

1. The particular instructional approach did not affect the students' performance on the written test, i.e., in demonstrating knowledge of the (a) names and locations of NOD-LR parts; (b) NOD-LR operation, maintenance, and safety; and (c) measurement characteristics and use of the scales and indicators.

2. Videotape instruction without the picture guide and platform instruction with the picture guide were the most effective training approaches in terms of the students' performance on the work sample test, i.e., assembly and disassembly procedures, preoperational checks and inspections, and the settings for the various modes of operation.

3. The use of the picture guide aided the students' qualitative performance on the procedural tasks.

These results suggest a number of possible alternative methods of training NOD-LR operators. The various alternative training methods for two different training requirements may be illustrated thus:

Training Requirements:	Proficiency of Performance	Quality and Proficiency of Performance
Training Method	Videotape Instruction; No Picture Guide	Videotape Instruction; Picture Guide
Alternatives:	Platform Instruction; Picture Guide	Platform Instruction; Picture Guide

In the first situation, proficiency of performance, i.e., how much the student can correctly accomplish, is a primary requirement; whereas in the second situation, quality of performance, i.e., the use of prescribed procedures, in addition to quantity of performance, is a primary requirement.

Ultimately, the Army trainer, in making the decision as to the "best" of the alternative training methods, must take into consideration factors such as cost, standardized administration, importance of quality of performance, and number of people to be trained.



APPENDICES

APPENDIX A: Instructional Objectives for Course in NOD-LR Operation and Maintenance

A. With all the necessary training materials provided by the instructor, the student must be able to state in writing the name and location of all NOD-LR components within 10 minutes and with 100% accuracy.

1. Given a visual of the tripod subassembly for the NOD-LR, the student must be able to state in writing the name and location of its component parts without error.

2. Given a visual of the yoke subassembly for the NOD-LR, the student must be able to state in writing the name and location of its component parts without error.

3. Given a visual of the viewer subassembly for the NOD-LR, the student must be able to state in writing the name and location of its component parts without error.

4. Given a visual of the illuminator subassembly for the NOD-LR, the student must be able to state in writing the name and location of its component parts without error.

B. With all the necessary training materials provided by the instructor, the student must be able to state in writing the mil elevation and mil azimuth of a target with 100% accuracy.

1. Without the use of reference material, the student must be able to state in writing the total number of mils on the azimuth scale without error.

2. Without the use of reference material, the student must be able to state in writing the number of mils per unit on the azimuth scale without error.

3. Without the use of reference material, the student must be able to state in writing the total number of mils on the elevation scale without error.

4. Without the use of reference material, the student must be able to state in writing the number of mils per unit on the elevation scale without error.

C. Given the NOD-LR, the student must be able to assemble the four major subassemblies in 15 minutes with 100% accuracy.

1. Given a tripod secured to a back-pack, the student must be able to remove the tripod from the back-pack without error.

2. Given a collapsed tripod, the student must be able to erect the tripod without error.

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Fort Rucker, Ala. 36360

C. (Continued)

3. Given an erected tripod, the student must be able to place, level, and secure the yoke to the tripod without error.

4. Given an erected tripod and yoke, the student must be able to secure the viewer to the yoke without error.

5. Given an erected tripod, yoke, and viewer, the student must be able to secure the illuminator to the viewer without error.

D. Given the NOD-LR (or procedural simulator), the student must be able to perform the preoperational inspections and checks with 80% accuracy.

1. Given the NOD-LR, the student must be able to perform the four preoperational checks on the discrete control panel without error.

2. Given the NOD-LR, the student must be able to perform the five preoperational checks on the continuous control panel without error.

3. Given the NOD-LR, with its control panels preoperationally set, the student must be able to perform the preoperational inspections without error.

E. Given the NOD-LR, the student must be able to place it into its prime modes of operation with 100% accuracy.

1. Given the NOD-LR, the student must be able to place it in Stand-by mode, without error.

2. Given the NOD-LR, the student must be able to place it in Stand-by Passive mode, without error.

3. Given the NOD-LR, the student must be able to place it into Passive Prime mode, without error.

4. Given the NOD-LR, the student must be able to place it into Active mode, without error.

F. Given the NOD-LR, the student must be able to place it into its secondary modes of operation with 100% accuracy.

1. Given the NOD-LR, the student must be able to place it into Passive Alternate mode, without error.

2. Given the NOD-LR, the student must be able to place it into Active mode/Passive use, without error.

G. Given a list of operational situations, the student must be able to



G. (Continued)

state in writing the mode(s) of operation which is (are) applicable for each of the situations, without error.

1. Given an operational situation of extreme darkness, the student must be able to state in writing the mode of operation in which the NOD-LR should be placed, without error. (Active)

2. Given an operational situation to determine the range to a target with the NOD-LR, the student must be able to state in writing the mode of operation in which the NOD-LR should be placed, without error. (Active)

3. Given an operational situation in which the NOD-LR is not to be employed for several hours, the student must be able to state in writing the mode of operation in which the NOD-LR should be placed, without error. (Standby and Standby Passive)

4. Given an operational situation in which the NOD-LR is to be used to detect and identify targets under normal darkness conditions, the student must be able to state in writing the mode of operation in which the NOD-LR should be placed, without error. (Passive Prime)

5. Given an operational situation in which the NOD-LR is to be used to detect and identify targets when the primary source of power is nonfunctional, the student must be able to state in writing the mode of operation in which the NOD-LR should be placed, without error. (Passive Alternate)

6. Given an operational situation in which the darkness level is above normal and the NOD-LR is to be used to detect and identify targets, the student must be able to state in writing the mode of operation in which the NOD-LR should be placed, without error. (Active mode/Passive use)

H. Without the use of reference material, the student must be able to state in writing the procedures involved in performing each of the three maintenance tasks on the NOD-LR, without error.

1. Without the use of reference material, the student must be able to state in writing the procedures involved in maintaining the internal battery for the NOD-LR, without error.

2. Without the use of reference material, the student must be able to state in writing the procedures involved in maintaining the azimuth and elevation scale lamps, without error.

3. Without the use of reference material, the student must be able to state in writing the procedures involved in maintaining the viewer lens, without error.

I. Given the NOD-LR, the student must be able to disassemble the four major subassemblies in 10 minutes with 100% accuracy.

1. Given a completely assembled NOD-LR, the student must be able to remove the illuminator from the viewer without error.

2. Given an assembled tripod, yoke, and viewer, the student must be able to remove the viewer from the yoke without error.

3. Given an assembled tripod and yoke, the student must be able to remove the yoke from the tripod without error.

4. Given an erected tripod, the student must be able to collapse the tripod without error.

5. Given the collapsed tripod, the student must be able to secure the tripod to the back-pack without error.

J. Without the use of reference material, the student must be able to state in writing the following laser safety precautions for the NOD-LR, without error:

1. Looking into the primary beam and at specular reflection of the beam must be avoided.

2. Protective eyewear with a minimum optical density of 3 at 860 nm will be available at the NOD-LR at all times should their use be required. This eyewear must be worn when:

- a. Personnel are within the designated danger area.

- b. Personnel are within one meter of the beam path during operation of the laser in rain, snow, fog, or dust.

- c. Flat specular material is located in the danger area.

3. Personnel must be away from the beam path to a distance where power or energy density is within permissible levels, i.e., 30 meters.

4. The tracking of nontarget vehicular traffic or aircraft is prohibited.

K. Given a NOD-LR (or visuals), the student must be able to detect and identify stationary and moving targets during periods of darkness and at ranges of between        and        meters with 75% accuracy.

1. Given a NOD-LR, the student must be able to scan an assigned area without error.

2. Given a NOD-LR and visuals, the student must be able to identify the differences between targets as viewed through the NOD-LR during

K. (Continued)

darkness, and targets as viewed through the eye during daylight, without error.

L. Given a NOD-LR (or procedural simulator and visuals), the student must be able to demonstrate the two ways of designating stationary and moving targets during periods of darkness and at ranges between \_\_\_\_\_ and \_\_\_\_\_ meters, with 100% accuracy.\*

1. Given a NOD-LR, the student must be able to demonstrate the normal method of designating moving or stationary targets during periods of darkness and at ranges between \_\_\_\_\_ and \_\_\_\_\_ meters with 100% accuracy.

2. Given a NOD-LR, the student must be able to demonstrate the "target designate" method of designating moving or stationary targets during periods of darkness and at ranges between \_\_\_\_\_ and \_\_\_\_\_ meters with 100% accuracy.

M. Given a NOD-LR (or procedural simulator and visuals), the student must be able to demonstrate the two methods of determining range to stationary or moving targets during periods of darkness and at ranges between \_\_\_\_\_ and \_\_\_\_\_ meters with 75% accuracy.

1. Given a NOD-LR, the student must be able to "back light" a stationary or moving target during periods of darkness and at ranges between \_\_\_\_\_ and \_\_\_\_\_ meters with 75% accuracy.

2. Given a NOD-LR, the student must be able to "front light" a stationary or moving target during periods of darkness and at ranges between \_\_\_\_\_ and \_\_\_\_\_ meters with 75% accuracy.

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\*Specific ranges are classified.



## APPENDIX B: Course Outline

### I. General Orientation

- .Purpose of the NOD-LR and Its Army Role
- .System Concept
- .General Description of the NOD-LR

### II. Assembly of NOD-LR

- .Viewer Subassembly
- .Illuminator Subassembly

### III. Theory and Practice of NOD-LR Operations

- .Preoperational Inspections
- .Preoperational Checks
- .Modes of Operation
- .Field Operations

### IV. Power Sources and System Maintenance

- .Primary Power
- .Secondary Power
- .Operator Maintenance

### V. Disassembly of NOD-LR

- .Illuminator Subassembly
- .Viewer Subassembly
- .Mount and Tripod Subassemblies

### VI. Familiarization on Target Identification and Recognition

### VII. Laser Safety

### VIII. Assembly/Disassembly of the NOD-LR (Practice)

### IX. Preoperational Inspections, Checks, and Modes of Operation (Practice)

### X. Ranging and Target Designation (Practice)

APPENDIX C: Class Quizzes

QUIZ 1

1. What is the total number of mils on the azimuth scale?
2. How many mils are there between each line on the azimuth scale?
3. What is the total number of mils on the elevation scale?
4. How many mils are there between each line on the elevation scale?
5. An operator has detected a target. What are the azimuth and elevation readings of the target as represented in the figures below?

QUIZ 2

1. Here is a visual of the NOD-LR (Figure C 1). Label all the sub-assemblies and the various parts of the subassemblies.



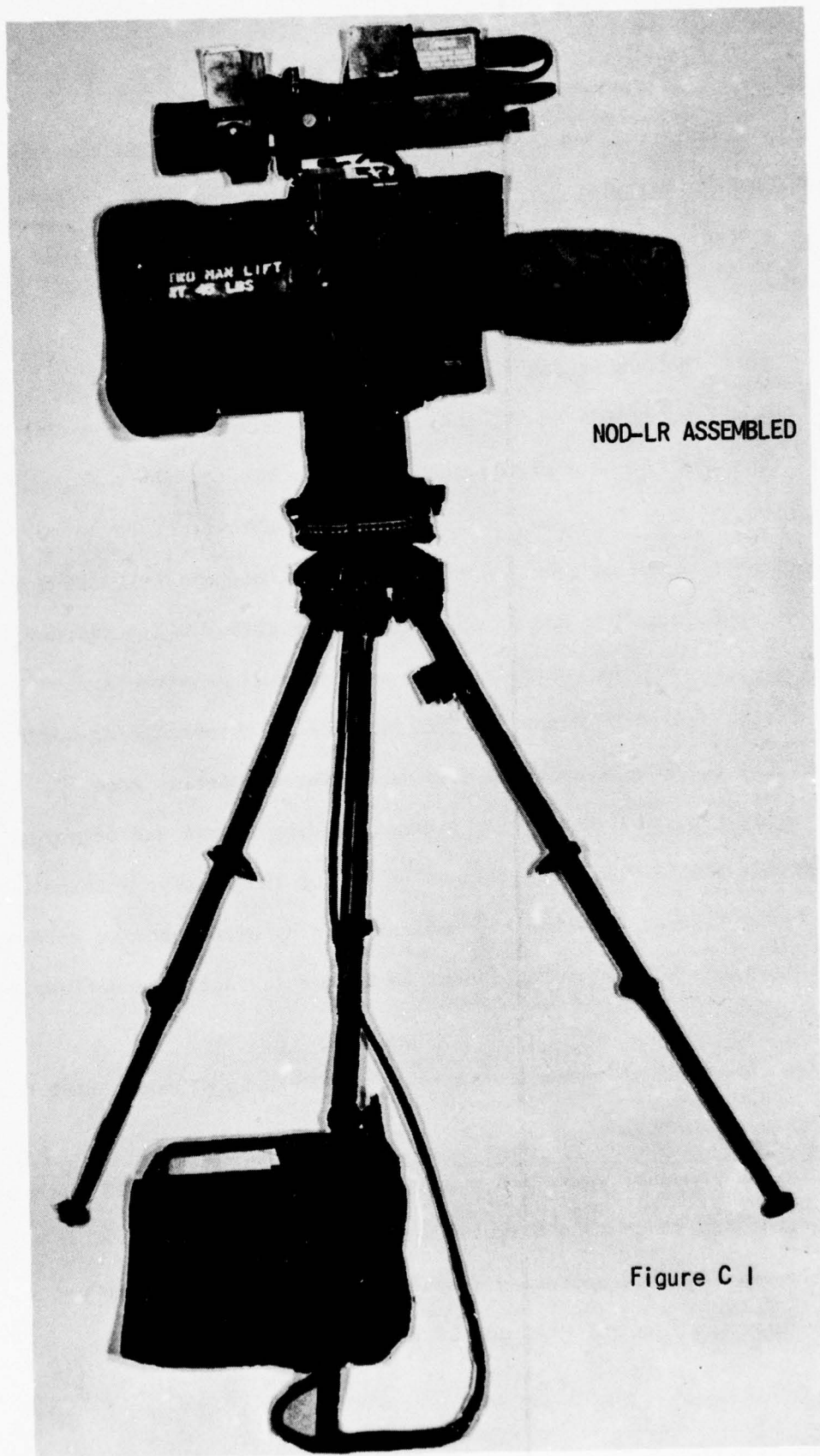


Figure C 1

### QUIZ 3

1. In Figures C 2 and 3 you will find visuals of the control panels of the NOD-LR. Using arrows to indicate direction and words to indicate action or direction, show the position which the NOD-LR controls must be in when the preoperational checks are performed.

NOTE: Each student was given seven copies of Figure C 2 and seven copies of Figure C 3 (appropriately numbered).

2. Using Figures C 4 and 5, indicate (using arrows and/or words) the positions the NOD-LR controls must be in for the Standby mode.
3. Using Figures C 6 and 7, indicate (using arrows and/or words) the positions the NOD-LR controls must be in for the Standby Passive mode.
4. Using Figures C 8 and 9, indicate (using arrows and/or words) the positions the NOD-LR controls must be in for the Passive Prime mode.
5. Using Figures C 10 and 11, indicate (using arrows and/or words) the positions the NOD-LR controls must be in for the Active mode.
6. Using Figures C 12 and 13, indicate (using arrows and/or words) the positions the NOD-LR controls must be in for the Passive Alternate mode.
7. Using Figures C 14 and 15, indicate (using arrows and/or words) the positions the NOD-LR controls must be in for the Active mode/Passive use mode.
8. In what mode of operation should the NOD-LR be placed during periods of extreme darkness?
9. In what mode of operation should the NOD-LR be placed if you want to determine the range to a target?
10. In what mode of operation should the NOD-LR be placed if you are just setting it up and will not be using it for several hours?

CONTINUOUS CONTROL PANEL

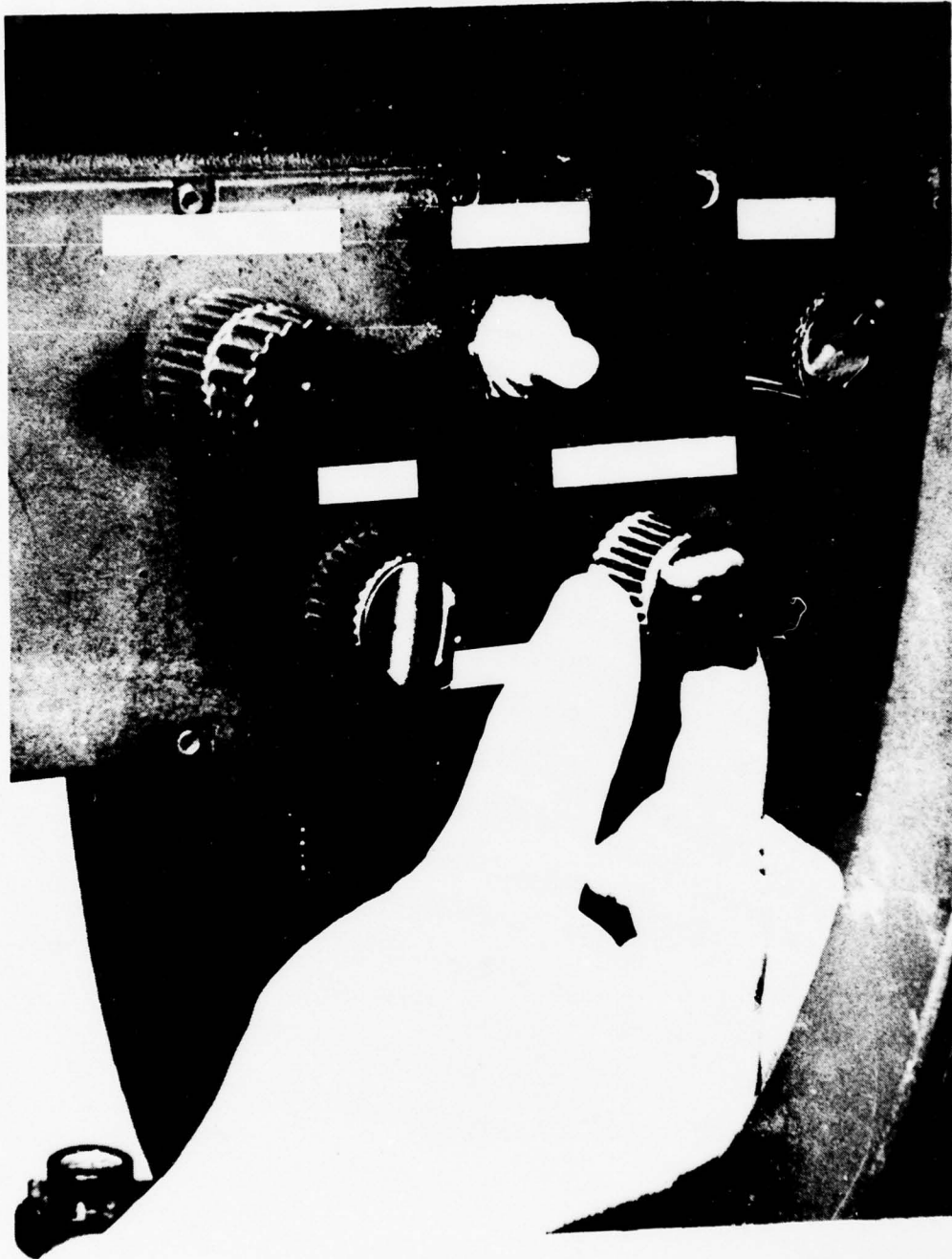


Figure C 2

(FIGURES C 4, 6, 8, 10, 12, AND 14 ARE IDENTICAL)



DISCRETE CONTROL PANEL

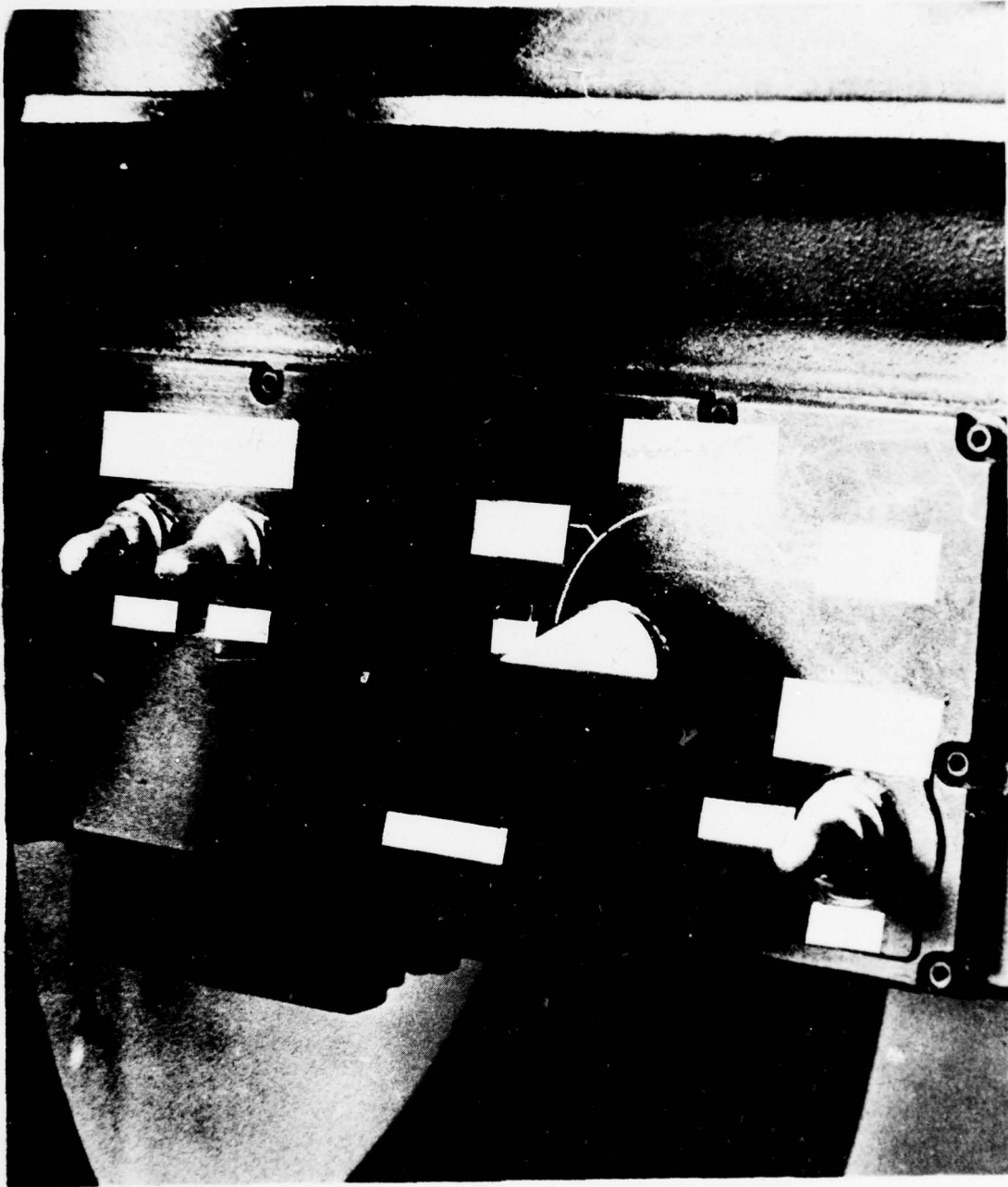


Figure C 3

(FIGURES C 5, 7, 9, 11, 13, AND 15 ARE IDENTICAL)

QUIZ 3 (Continued)

11. In what mode of operation should the NOD-LR be placed during periods of normal starlight or moonlight conditions?
12. In what mode of operation should the NOD-LR be placed during periods when the primary power source is nonfunctional?
13. In what mode of operation should the NOD-LR be placed during periods in which the darkness level is above normal, i.e., on very bright nights?

QUIZ 4

1. List the procedures involved in maintaining the internal battery.

2. List the procedures involved in maintaining the azimuth and elevation scale lamps.



QUIZ 4 (Continued)

3. List the procedures involved in maintaining the viewer lens.

4. List the procedures for changing the system's fuses.

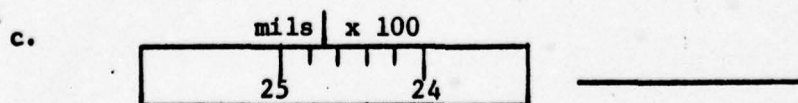
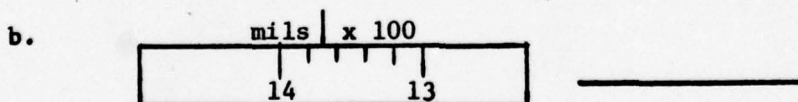
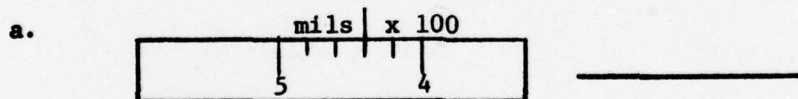
QUIZ 5

1. List the safety precautions which should be taken when the NOD-LR laser is in use.

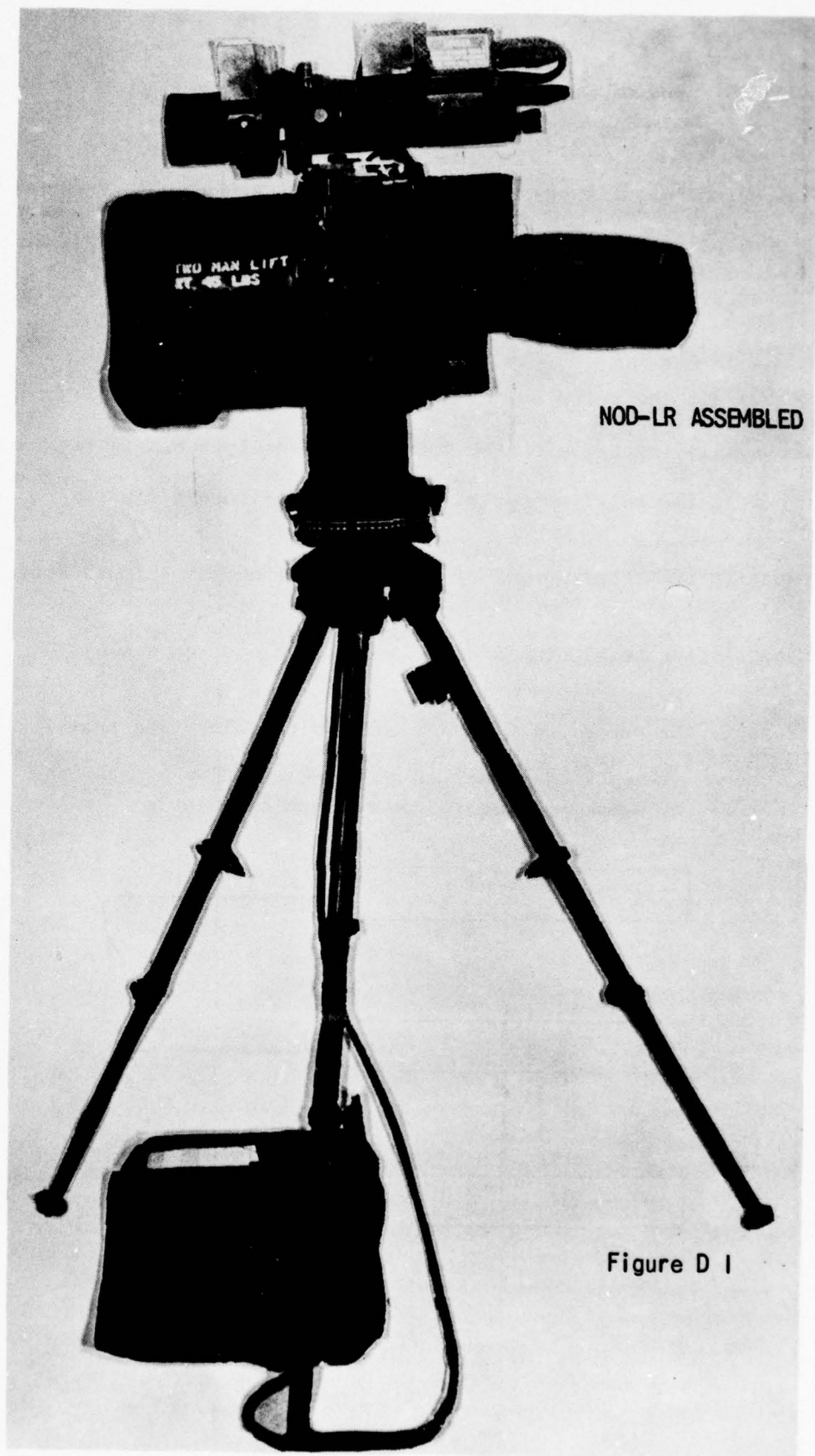
APPENDIX D: End of Course Tests

WRITTEN TEST

1. Label the major subassemblies of the NOD-LR system in Figure D 1.
2. Label all the parts of the NOD-LR subassembly shown in Figure D 2.
3. Label all the parts of the NOD-LR subassembly shown in Figure D 3.
4. Label all the parts of the NOD-LR subassembly shown in Figure D 4.
5. Label all the parts of the NOD-LR subassembly shown in Figure D 5.
6. Label all the parts of the NOD-LR subassembly shown in Figure D 6.
7. What is the total number of mils on the azimuth scale?
8. What is the total number of mils per unit on the azimuth scale?
9. What is the total number of mils on the elevation scale?
10. What is the number of mils per unit on the elevation scale?
11. What is the azimuth indicated on the scales below?

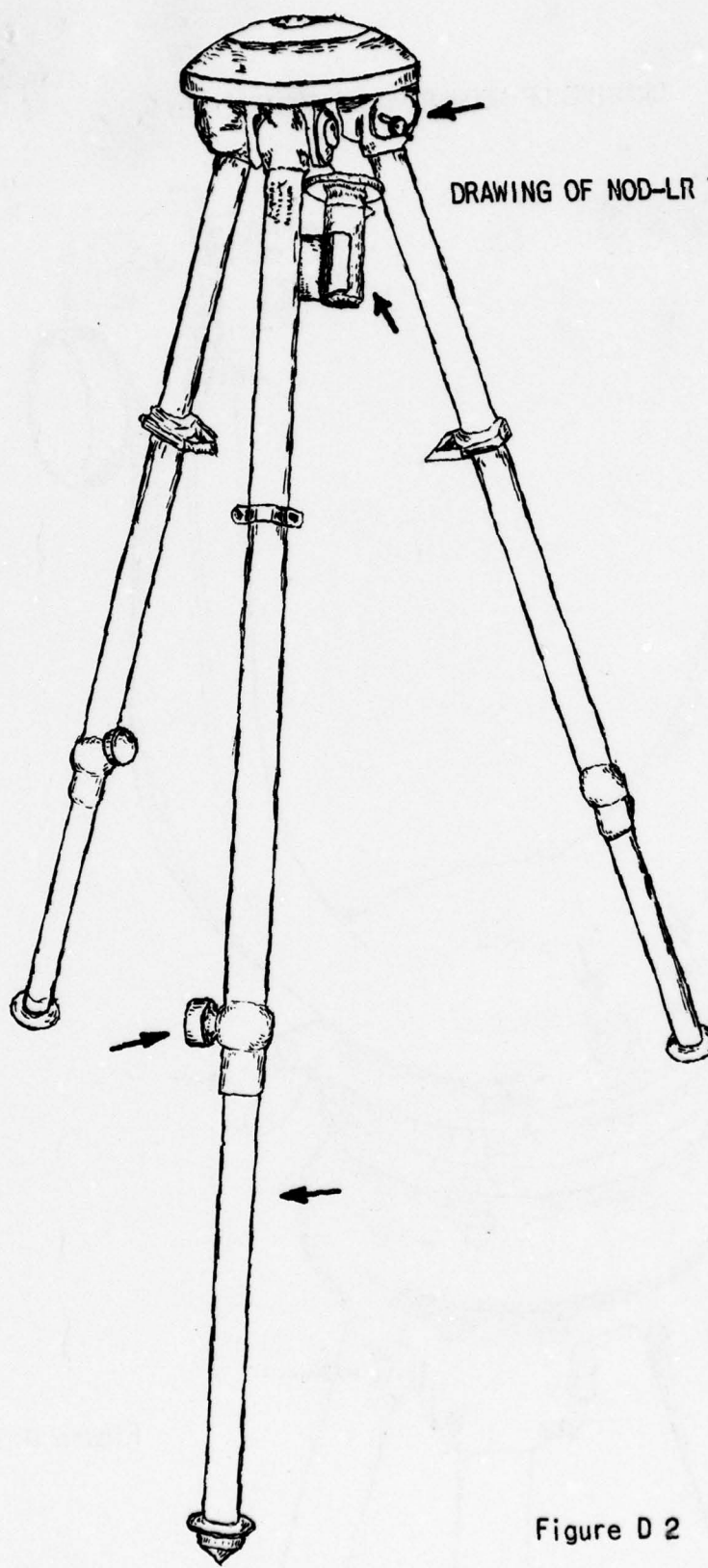






NOD-LR ASSEMBLED

Figure D 1



DRAWING OF NOD-LR TRIPOD SUBASSEMBLY

Figure D 2

DRAWING OF NOD-LR MOUNT SUBASSEMBLY

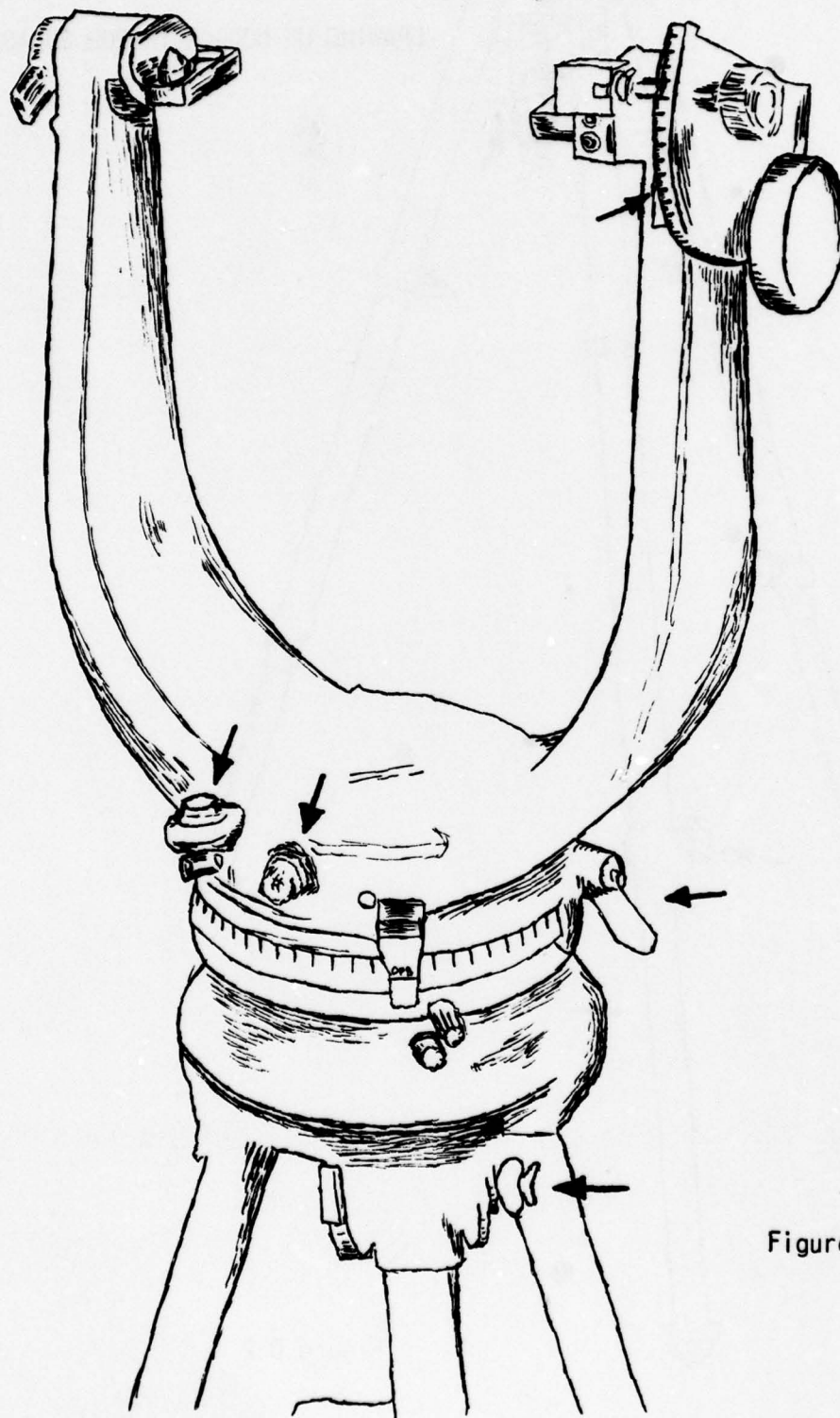


Figure D 3



CONTINUOUS CONTROL PANEL

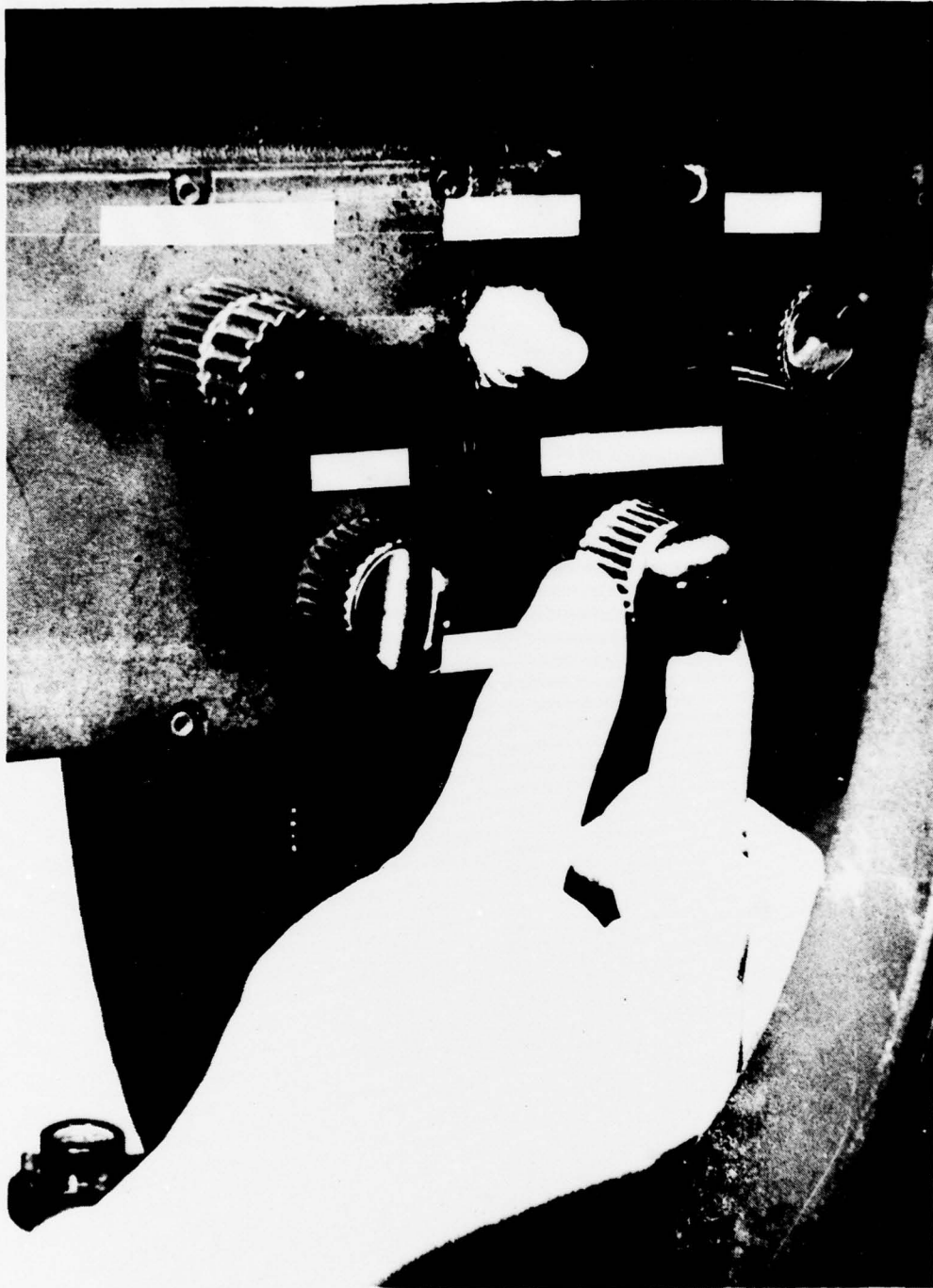


Figure D 4

DISCRETE CONTROL PANEL

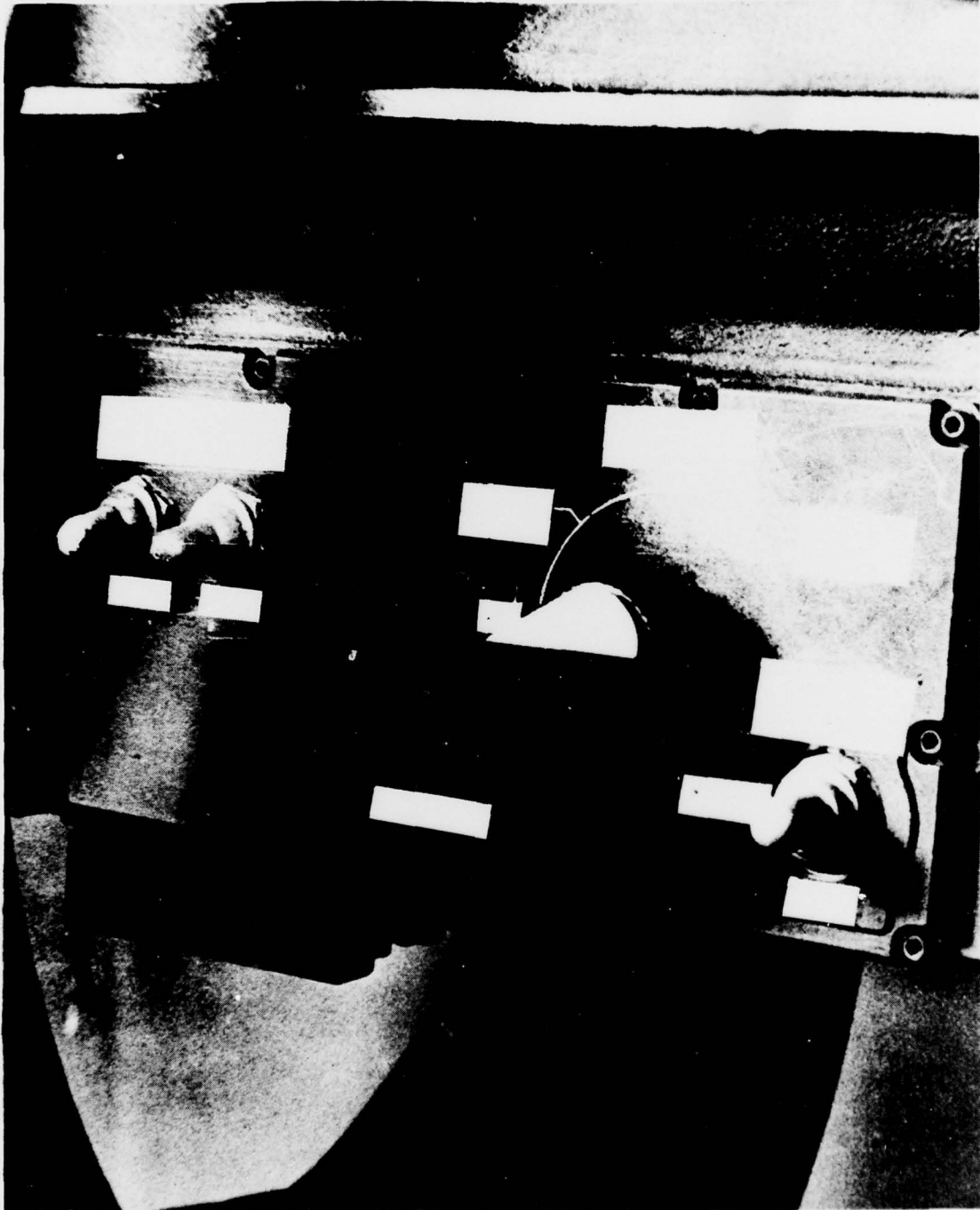


Figure D 5

DRAWING OF NOD-LR ILLUMINATOR SUBASSEMBLY

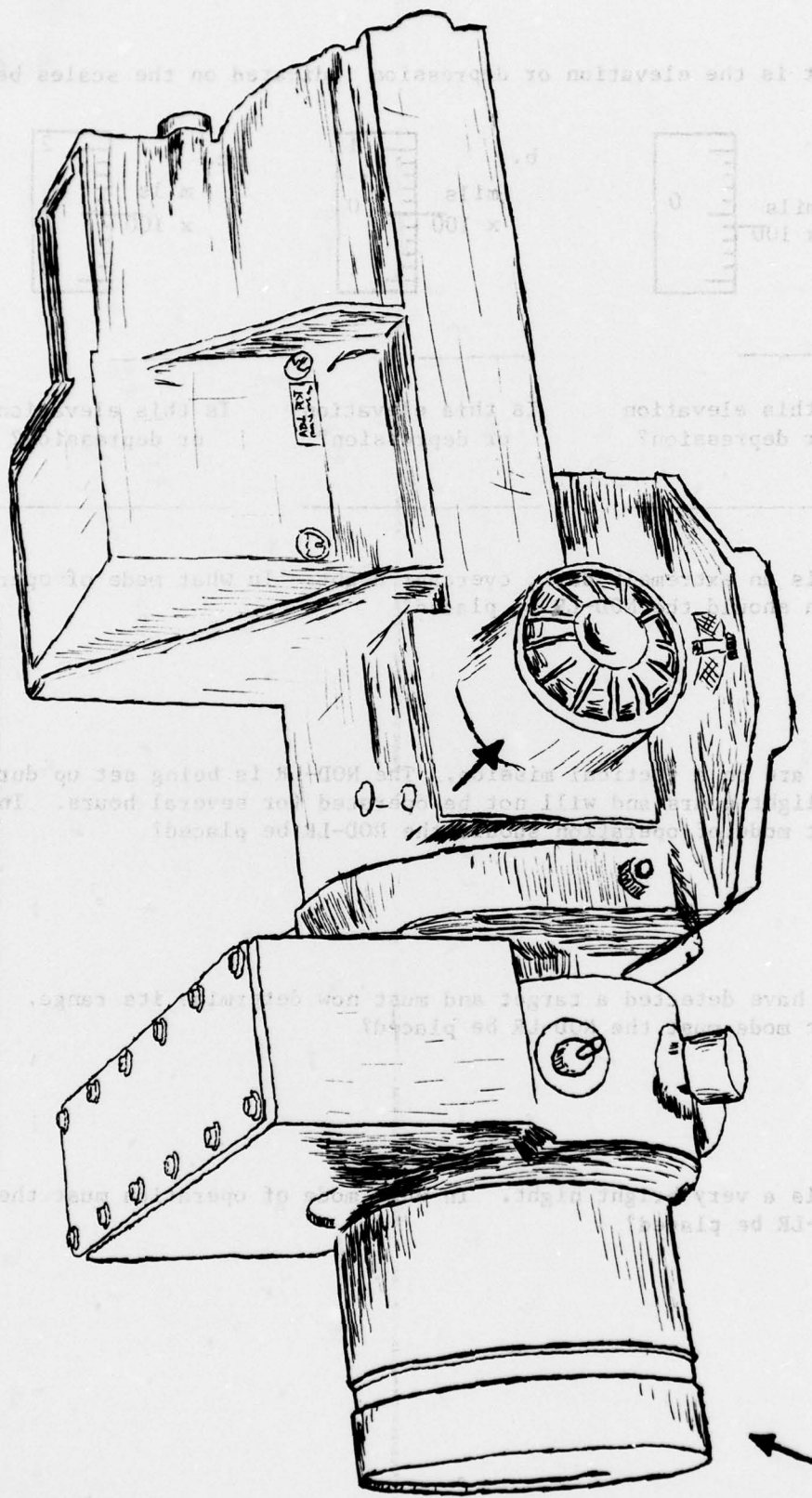
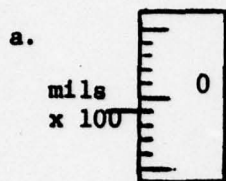


Figure D 6



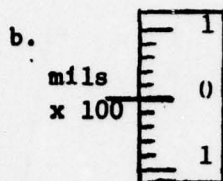
12. What is the elevation or depression indicated on the scales below?



\_\_\_\_\_

Is this elevation  
or depression?

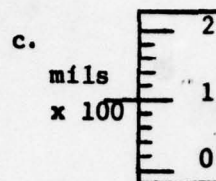
\_\_\_\_\_



\_\_\_\_\_

Is this elevation  
or depression?

\_\_\_\_\_



\_\_\_\_\_

Is this elevation  
or depression?

\_\_\_\_\_

13. It is an extremely dark, overcast night. In what mode of operation should the NOD-LR be placed?
14. You are on a tactical mission. The NOD-LR is being set up during daylight hours and will not be operated for several hours. In what mode of operation should the NOD-LR be placed?
15. You have detected a target and must now determine its range. In what mode must the NOD-LR be placed?
16. It is a very bright night. In what mode of operation must the NOD-LR be placed?

17. You are to detect and identify targets under normal darkness conditions. In what mode of operation must the NOD-LR be placed?
18. The NOD-LR's primary power source is nonfunctional. In what mode may the NOD-LR be used?
19. List the procedures used in maintaining the azimuth and elevation scale lamps.
20. List the procedures used in maintaining the objective lens.

21. List the procedures used in maintaining the internal battery.

22. List three safety precautions which must be taken when the NOD-LR's laser is in use.

a.

b.

c.



## WORK SAMPLE TEST

### Directions to Student:

- I. "Here are the subassemblies of a NOD-LR - assemble them."

### Procedure

1. unbuckle tripod \_\_\_\_\_
2. remove tripod \_\_\_\_\_
3. loosen knurled knobs \_\_\_\_\_
4. lift tripod to chest height \_\_\_\_\_
5. tighten knobs on each leg \_\_\_\_\_
6. loosen wingnuts \_\_\_\_\_
7. push in and disengage teeth \_\_\_\_\_
8. swing legs out and form a level base \_\_\_\_\_
9. tighten wingnut \_\_\_\_\_
10. push down to verify that the tripod is level \_\_\_\_\_
11. unbuckle straps on mount backpack \_\_\_\_\_
12. open backpack cover \_\_\_\_\_
13. remove mount \_\_\_\_\_
14. insert threaded mounting device \_\_\_\_\_
15. pull locking handle free from holder \_\_\_\_\_
16. screw handle on \_\_\_\_\_
17. check bubble level \_\_\_\_\_
18. tighten handle securely \_\_\_\_\_
19. loosen elevation knob \_\_\_\_\_
20. unbuckle straps on viewer backpack and lift cover  
off \_\_\_\_\_
21. grasp viewer at sideplates and lift out \_\_\_\_\_

22. assistant grasps objective lens end and brings viewer to level position
23. lift viewer over top of mount
24. guide viewer into the seat of the mount
25. turn locking bolts on each side of the mount
26. grasp illuminator and lift out of backpack
27. assistant grasps laser end and brings to a level position
28. lift illuminator over the top of viewer
29. guide illuminator into seat of mounting plates
30. turn locking screws each side of illuminator
31. unscrew J4 cap on viewer
32. grasp small cable from illuminator screw and tighten
33. unscrew J3 cap on viewer
34. grasp large cables from illuminator
35. align male end of plug at J3 socket
36. push in and tighten
37. remove small mount cable
38. unscrew J1 cap on viewer
39. align male end of plug at J1 socket
40. push in and tighten
41. align female end of plug at J2 on mount
42. push in and tighten
43. remove main battery cable from illuminator backpack
44. unscrew cap at prime power socket
45. align battery cable plug at prime power socket

46. push in and completely tighten \_\_\_\_\_
47. unbuckle straps on battery \_\_\_\_\_
48. pull battery cap off \_\_\_\_\_
49. align male end of plug at battery socket and  
push in \_\_\_\_\_

## II. "Disassemble the NOD-LR."

### Procedure

1. turn mode select to OFF \_\_\_\_\_
2. set power switch to OFF \_\_\_\_\_
3. set cooler switch to OFF \_\_\_\_\_
4. disconnect battery cable from viewer \_\_\_\_\_
5. screw cap on \_\_\_\_\_
6. disconnect cable at battery \_\_\_\_\_
7. replace battery cap \_\_\_\_\_
8. unscrew mount cable (top) \_\_\_\_\_
9. screw on cap \_\_\_\_\_
10. unscrew mount cable (bottom) \_\_\_\_\_
11. unscrew large illuminator cable \_\_\_\_\_
12. screw on cap \_\_\_\_\_
13. unscrew small illuminator cable \_\_\_\_\_
14. screw on cap \_\_\_\_\_
15. loosen locking screws (illuminator) \_\_\_\_\_
16. dismount and place in carrying case \_\_\_\_\_
17. loosen locking screws (viewer) \_\_\_\_\_
18. dismount and place viewer in backpack \_\_\_\_\_
19. unscrew locking handle \_\_\_\_\_



20. snap locking handle into clamp
21. place mount in backpack
22. close backpack
23. loosen wingnut
24. push in to disengage teeth
25. collapse legs
26. tighten wingnut
27. retract legs and tighten knobs
28. attach tripod to illuminator backpack

III. "Perform the Preoperational Inspections."

Procedure

1. rotate diopter and main focus ring
2. remove the objective lens cover
3. check lens
4. set power switch to ON
5. turn mode select to ACTIVE
6. push read-out switch down and hold
7. verify illumination of indicators:
  - DOF
  - Range
  - Azimuth
  - Elevation
8. turn mode select to PASSIVE (bottom)
9. verify illumination of indicators:
  - Azimuth
  - Elevation

10. turn mode select to OFF
11. set cooler switch to ON
12. feel cooler for fan exhaust
13. set cooler switch to OFF
14. press level bubble button
15. set power to OFF

IV. "Perform the Preoperational Checks."

Procedure

Discrete Control Panel

1. verify that power is OFF
2. verify that cooler is OFF
3. verify that mode select is OFF
4. verify that beam select is in Center

Continuous Control Panel

5. verify that DOF is CW
6. verify that Brightness is fully CCW
7. verify that Focus is fully CCW
8. unscrew moonshield locking knobs
9. pull moonshield out
10. lock moonshield locking knobs

V. "Place the NOD-LR in Standby mode."

Procedure

1. set power to ON
2. set cooler to ON

VI. "Place the NOD-LR in Standby Passive mode."

Procedure

1. set power switch to ON
2. set cooler switch to ON
3. turn mode select to PASSIVE PRIME
4. adjust diopter ring
5. adjust mechanical focus ring
6. adjust electronic focus ring

VII. "Place the NOD-LR in Passive Prime mode."

Procedure

1. set power switch to ON
2. turn mode select to PASSIVE PRIME
3. adjust diopter ring
4. adjust mechanical focus ring

VIII. "Place NOD-LR in Passive (battery) mode."

Procedure

1. set power switch to ON
2. turn mode select to PASSIVE (battery)
3. adjust diopter ring
4. adjust mechanical focus ring

IX. "Place NOD-LR in Active mode."

Procedure

1. set power switch to ON
2. set cooler switch to ON



3. adjust mechanical focus ring

4. adjust electronic focus

5. adjust brightness

X. "Place NOD-LR in Active mode/Passive use."

Procedure

1. set power switch to ON

2. turn mode select to ACTIVE

# FIELD TEST

1. Given the conditions this evening, in what mode will you view?

right \_\_\_\_\_

wrong \_\_\_\_\_

2. You are to scan, i.e., move the NODLR viewer, in the area between

\_\_\_\_\_ and \_\_\_\_\_.

Let me know when you detect a target. Do you have any questions?

Begin.

	Order of Detection	D	A	E	I	R
Target 1:						
Target 2:						
Target 3:						
Target 4:						